**ABSTRACT**

In a method to improve the calibration of a non-invasive, near infrared (NIR) measurement device, a plurality of data terms is formed for the NIR measurement device. Then the codependence of the data terms is evaluated by forming cross-products terms using the data terms. Next, sets of prespecified sizes are randomly formed from the data terms and the cross-product terms. Each of these sets of terms is evaluated by testing the ability of the set to predict a set of accurate measurements using regression analysis. The method then selects one of the sets based on preselected criteria and uses the selected set to calibrate the NIR measurement device.